succinct account of the various classes of pharmaceutical preparations, with tables of doses of the individual members of each.

The rest of the book is chiefly taken up with an account of the preparation, characters, doses, actions, and uses of the various remedial agents. Here we find all that valuable empirical knowledge of the use of drugs which science has so far failed to analyse, but which in course of time will no doubt be incorporated with the first section. Section III. is concerned with the inorganic remedies, Section V. with those obtained from plants, and Section VI. with those derived from animals. Section IV., "Organic Materia Medica," requires special notice. It includes all the carbon compounds employed in medicine which are obtained by synthesis.

Pharmacology owes much to the enterprise of the chemist. In the first place, the extraction of definite active principles from the various vegetable structures used in the Pharmacopœia has been of inestimable value. It was formerly impossible to be sure that the preparations made year by year were of the same strength. The environment of the plant varies more or less each season, so that at one time it may manufacture more of its active principles than at another. Moreover some plants contain several powerful ingredients which are of more value apart than together. The extraction and isolation of these substances has therefore led to a correct dosage and their more definite application to the treatment of disease.

In the second place the chemist is making us by degrees independent of the plant world by producing synthetically the bodies thus isolated. Just as the manufacture of alizarine from anthracene made the dyer independent of the madder root, so the artificial production of salicylic acid has supplanted the willow. In course of time, no doubt, as Dr. Brunton suggests, this section of Materia Medica will develop greatly, whilst the number of animal and vegetable preparations will correspondingly diminish. We are not, however—thanks again to chemical research—limited merely to those principles already in the Pharmacopœia. Already we are supplied with a host of substances, the products of synthesis, amongst which many of the valuable drugs of the future will doubtless be found. Organic synthesis, apart from the valuable substances which it may yield us, as the bodies kairin and antipyrin, which have already found their use in medicine, is of extreme importance to the pharmacologist from another standpoint, for it enables him to form conjectures as to the molecular structure of compounds. So far but few definite relations have been established between chemical constitution and physiological action. Still, enough has been done to demonstrate the existence of such relations and to promise a fruitful harvest hereafter. It has been proved, for instance (Crum Brown and Fraser), that the introduction of the methyl group into the molecule of an alkaloid gives it the power of paralysing the end-organs of motor nerves. Similarly Drs. Brunton and Cash have found as a general rule that most of the compound radicals formed by the union of amidogen with the radicals of the marsh-gas series possess a paralysing action on motor nerves.

It is probable that just as in the members of homologous series we have a gradation of physical properties and a similarity of chemical reactions, so bodies having similar chemical constitution will be found to resemble each other in physiological action. Induction will then lead to deduction, and the paths in which we are to tread in order to find drugs endowed with certain properties will be indicated; in illustration of this we note that already we know where to experiment if we wish to add to the number of our anæsthetics and antipyretics.

This review could not well close without a reference to the many useful illustrations and to the elaborate indices (extending to 131 pages), which add materially to the value of the work. It will rank as the text-book on the subjects of which it treats, being at once the best exponent of existing knowledge and a powerful stimulus to further progress.

ARTHUR GAMGEE

ELEMENTARY PRACTICAL PHYSICS

Lessons in Elementary Practical Physics. By Balfour Stewart, M.A., LL.D., F.R.S., Professor of Physics Victoria University, the Owens College, Manchester, and W. W. Haldane Gee, Demonstrator and Assistant Lecturer in Physics, the Owens College. Vol. I. (London: Macmillan and Co., 1885.)

IN this the first volume of what will evidently be an elaborate work on practical physics, the authors have treated of general physical processes only, *i.e.* of the methods employed in the laboratory for the exact determination or measurement of the geometrical and mechanical properties of bodies. It is impossible to over-estimate the importance of these fundamental measures, for upon them depends the accuracy of almost all physical work. That this is the view of the authors is made evident by their having devoted nearly the whole of the first volume out of a promised three to matters purely geometrical and mechanical. Throughout the volume the most minute attention to details is apparent, so much so that it is likely to weary those who read it only; but those who use it to guide them in making the measures given will certainly benefit by the completeness with which each subject is treated.

The first chapter, on the measurement of length, may be taken as a type of the whole volume. The metre and the yard are first defined and their absolute relation stated; the actual relation of metre and yard scales—slightly differing from the absolute owing to the fact that 0° C. and 62° F. are the two temperatures of reference—is next explained. A paragraph on "end measure" and "line measure" concludes what is in effect an introduction to the first chapter. Then the "Lessons" in this chapter begin. The first lesson is on the use of scales. In this instructions are given for measuring a length with a pair of compasses and an ordinary or a diagonal scale. Results are given showing the limit of accuracy by this method. The second lesson is on the straight Vernier, the third on the barometer Vernier, the fourth on the spherometer, and the fifth on the micrometer wire gauge. Lesson 6 is a description with figures of the dividing engine of M. Perreaux, the use of which is the subject of the next lesson. The next five lessons of this chapter explain the copying of scales, the cathetometer with its adjustments, the micrometer microscope, the Whitworth measuring machine, the eyepiece and stage micrometer,

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while a general review of the subject of length measurement, in which other instruments and tools, including the cathetometer microscope, are described, concludes the chapter.

This brief review of the first is sufficient to show the system on which each of the eight chapters is put together.

In the second chapter on angular measurement the circular Vernier, the mirror and scale, and the spirit level of course form the subject of lessons. There is also a lesson on that simple and easily-constructed instrument of M. Cornu, the optical lever.

The chapter on the estimation of mass is very complete, for, besides an explanation of the theory and use of the balance, there is a page headed "precautions in weighing," a copy of which might well be placed on the wall above every balance in a laboratory; there is an excellent paragraph on the sensibility of the balance, with a diagram showing the observed sensibility of an Oertling, a Bunge, and another short beam balance. There is, lastly, a lesson on the errors of weights, in which instructions are given for testing a set of weights.

In the chapter on measurement of area and volume a large amount of space is given to an explanation of the Amsler planimeter. This beautiful little instrument, as is well known, gives the area of a figure round which its point is traced. In a new edition it is to be hoped that the new "precision" planimeters which in accuracy and some other respects are superior to that of Amsler, will be described.

In Chapter V., on the determination of density, are to be found full instructions for finding the specific gravity of solids and liquids by a host of methods. The corrections for buoyancy are carried to such an extent that account is taken of the latitude and the height above the sea-level in calculating the density of the air from the barometer reading; further, the effect of moisture in lightening the air is guarded against. The hydrometers of Fahrenheit, Baumé and Twaddle are described, and instructions are given for making them. The exact determination of the density of a gas, being a problem of great difficulty, is considered unsuitable for imitation in the laboratory; however, an outline of Regnault's method is given.

The chapter on elasticity, tenacity, and capillarity differs from others in the book in that the theory of the subject is given at length, as well as instructions for performing experiments in the laboratory.

The chapter on the determination of atmospheric pressure contains a full account of the method of filling and using a standard mercurial barometer. The aneroid barometer is not mentioned.

The last chapter, on time, gravitation, and moments of inertia, is purely mechanical. The difference between the sidereal, solar, and mean solar days is explained, but instructions are not given for taking a transit. Clocks, chronometers, stop-watches, the water-clock, and the chronograph of Hipp, in which a reed vibrating 1000 times a second replaces the pendulum of a clock, are briefly described.

The determination of *g* by Borda's and by Kater's method is given. Several forms of electro-chronograph are described—among them one in which a primary circuit is broken at the beginning and end of the interval to be measured, while the induced currents cause a spark to pass between the style of a tuning-fork and a smoked drum, so that the number of waves between the two dots produced by the sparks measures the time.

As has been already said, completeness and attention to details are apparent in every chapter of the first volume, while the names of the authors are sufficient as a guarantee of accuracy. The only cause for regret is the fact that the public has to wait for the two volumes on real physics, for those who read the first, which deals mainly with measurements of geometrical and mechanical properties, and which is therefore essentially an introduction, are likely to be impatient to see the series completed.

OUR BOOK SHELF

The History of a Lump of Gold from the Mine to the Mint. By Alexander Watt. (London: A. Johnson.)

THE author has endeavoured to treat his subject so as to interest general readers, but he might have spared them such moralisations, suggested by the word "gold," as "With what silent rapture we receive it as our own, and how different is the feeling when it comes into our hands merely to convey to another." The compilation of facts connected with the history of gold and its manufacture into coin has, however, been carefully done. Considering that the superstructure of modern chemistry was built up on the labours of the "early alchemists," we object to their being described as "those remarkable imposters," and indeed the quotations from the writings of the early chemists which are given abundantly prove their claim to more respectful treatment. The metallurgy of gold is dealt with in the most slender way, but the chapter relating to the operations of coinage is more satisfactory, and is confessedly an abstract of a series of Cantor lectures recently delivered by the chemist of the Mint.

The important question of the amount of gold actually in circulation has not been lost sight of, and the author sums it up by quoting the following passage:—"The amount of gold actually in circulation is estimated to be 100,000,000*l.*, but the coinage returns show that the amount of sovereigns and half-sovereigns issued since 1816, when their coinage began, is 247,521,429. What, then, has become of the one hundred and forty-seven millions not in circulation?" No doubt a considerable proportion has been exported never to return, but we do not think, with the author, that the operations of manufacturing goldsmiths and jewellers would account for a very large proportion of the deficiency.

There are some remarkable slips in the printing. For instance, the well-known historian of the coinage is called the Rev. Rogers Rudling, and Sir John Pettus appears as Petters; but viewed as a whole, the work may be commended as tending to disseminate information respecting the precious metal which it is desirable should be widely known.

Magnetism and Electricity. By W. G. Baker. (London: Blackie and Son.)

WITH the multitude of elementary text-books on magnetism and electricity already existing the production of a fresh one might well have seemed an unnecessary task. Nor is there anything in the little book now before us in the least degree new, either in matter or in arrangement. So far as it goes, however, it is quite satisfactory. It consists of 143 pages, and in this space the author has managed to give in a clear manner an account of so much of the subject as might reasonably be put before a

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